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V2491 Cyg - a possible recurrent nova ?

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Abstract. Nova V2491 Cyg was discovered on April 10.72 UT 2008 (Nakano 2008). Here we present spectrophotometric premises that V2491 Cyg can be a good candidate for recurrent nova (RNe). Its properties are compared to five well known RNe with red dwarf secondaries (U Sco, V394 Cra, T Pyx, CI Aql, IM Nor) and recently confirmed as recurrent nova V2487 Oph (Pagnotta et al. 2008). Photometric U, B, V, R_C, I_C and moderate resolution (R$\sim$ 1500) spectral observations of V2491 Cyg were carried out in the Torun Observatory (Poland) between April 14 and May 20 2008.

1. Optical spectrum of V2491 Cyg, mass and magnetic field of the white dwarf

In the spectrum of V2491 Cyg obtained at $\Delta t = +3.7^d$ the emmision lines NII 5679Å and NIII 4640Å typical for He/N novae, are apparent. Remarkable emission features mainly of HeII, NII and NIII are presented as well. The strong OI 8446 line suggests a Williams (1992) P_n^o type. Several days later at $\Delta t = +12.7^d$ the blend NIII, HeII at $\sim$4650Å is stronger than Hβ and its width implies probable presence of CIII as observed in other RNe (Munari et al. 1999; Duerbeck 2003; Sekiguchi et al. 1989). Another similarity between the mentioned above RNe and V2491 Cyg is the extreme width of the emission lines during the early outburst phase (left panel Figure 1.).

V2491 Cyg is the second nova observed in X-rays before the outburst. The first one was the newest member of the RNe group V2487 Oph. On the base of the X-ray observations a magnetic white dwarf primary was suggested for the two systems (Ibarra et al. 2008; Hernaz & Sala 2002; Takei et al. 2009). Both hard and soft X-ray behavior of V2491 Cyg was similar to that observed in the recurrent nova RS Oph which consists of a massive white dwarf and a red giant. Basing of this, Page et al. (2008) and Osborne et al. (2008) suggested that the relatively early emergence of the super-soft phase may indicate the presence of a massive white dwarf in V2491 Cyg as well. Hachisu & Kato (2009) estimated the mass of the white dwarf in V2491 Cyg to be 1.3M$\odot$ and assumed that the system is a polar with a 10^7G magnetic field. Such a mass is in good agreement with the masses derived for most RNe which are between 1.2M$\odot$ and 1.4M$\odot$ (see Hachisu & Kato 2001 and references therein).

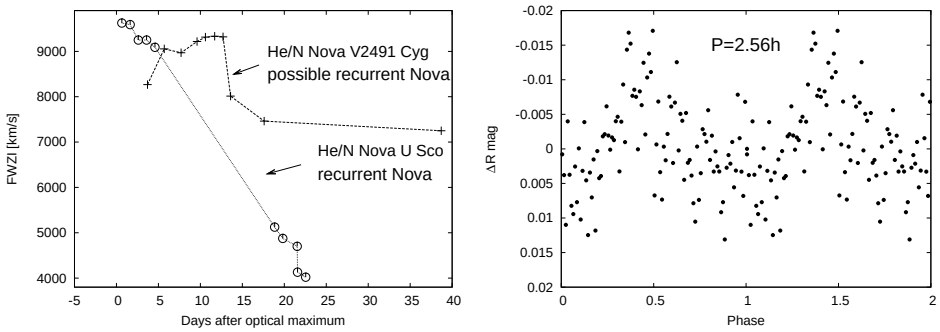

Figure 1. Left panel: Comparison of variations of the Hα FWZI in the post-maximum spectra of V2491 Cyg, and U Sco (the data for U Sco is extracted from Figure 4 in Munari et al. (1999)). Right panel: R band light curve of V2491 Cyg observed on 9, 11 and 15 May 2008 and phased with $P = 0.1067^d$. Each point represents an average value binned in 90 seconds intervals.

2. Outburst amplitude and orbital period of V2491 Cyg

Most of RNe have relatively smaller outburst amplitudes in comparison to the classical novae. On the base of Ritter & Kolb (2003) data we estimated the outburst amplitude as 10^m which is located in the range of values obtained for other RNe.

Fourier analysis of our R band observations revealed a period of 0.1067^d, very close to the period (0.0958^d) and its one-day alias (0.10595^d) Baklanov & Pavlenko (2008) (right panel in Figure 1). Such a short period puts V2491 Cyg together with IM Nor in the middle of the "period gap" of cataclasmic variables.

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